REDUCTION OF VEHICLE IMPACT SEVERITY BY REDESIGNED ROAD RESTRAINT SYSTEM DISTANCE SPACER

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The paper describes a computational design evaluation of a part of the road restraint system, which is used on public roads to prevent a vehicle to veer off the road or its breakthrough to the opposite side of the road. The road restraint systems, which are designed according to the European standard EN 1317, are intended to provide certain levels of vehicle containment, to redirect errant vehicles and to provide guidance for pedestrians and other road users. A proper design is therefore crucially important for safety of all road users.

Practical observations of the currently installed systems indicate that they are far too stiff, which is largely attributed to inappropriate design of used distance spacer. Some new design solutions are proposed, which have increased strain energy absorption due to controlled deformation during vehicle impact. Their suitability is evaluated with computational analyses of a three-dimensional barrier model subjected to test vehicle impact conditions as mandated by standard EN 1371. Explicit dynamics finite element code LS-DYNA is used for this purpose, with account for material, geometric and structural-contact nonlinearity.

The computational analyses prove that the currently used distance spacer is indeed far too stiff. The new designs deform in controllable manner and absorb significantly larger amount of vehicle kinetic energy, which in turn reduces decelerations experienced by vehicle occupants. It is shown that the hexagonally shaped distance spacer is the most appropriate for use on public roads.

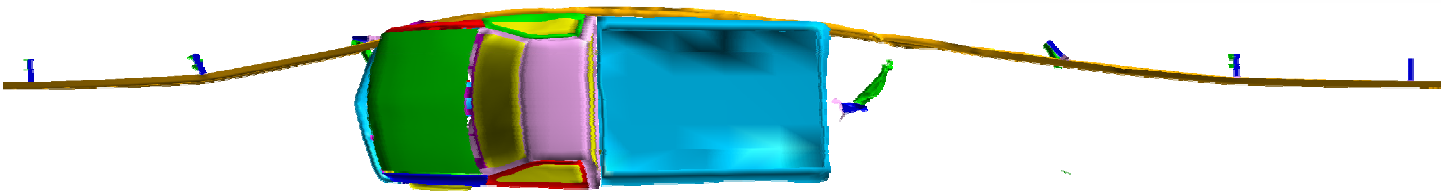

Figure: Dynamic simulation of road restraint system subjected to test vehicle impact.

References

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